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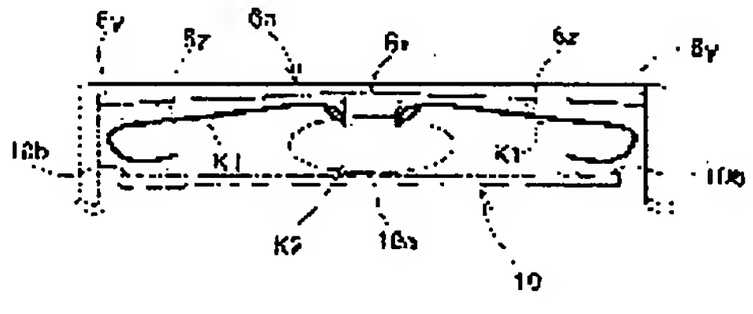
(54) METHOD AND APPARATUS FOR FORMING LIQUID FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an excellent liquid film forming apparatus capable of forming a liquid film which is as homogenous as possible by preventing the occurrence of the difference of a drying degree between a place where a chemical is first applied and a place where the chemical is applied last on a substrate to be treated to the minimum.

SOLUTION: A spiral applicator 1 discharges the chemical from a chemical feeding nozzle 8 moving in a radial direction over the rotating substrate to be treated 10 to apply the chemical in a spiral track on the substrate 10 for forming a liquid film on the substrate 10. On the side of the substrate 10 of a cover 6a covering thereon, a tapered surface 6z having a cross section shape is formed where a center side 6x in the radial direction is thin, and an outer periphery side 6y in the radial direction is thick in thickness. An application starting position of discharging the chemical from the nozzle 8 is set to the center side 10a of the substrate 10 in the radial direction, and the application finishing position of the chemical is set to the outer peripheral side 10b of the substrate 10 in the radial direction.



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* NOTICES *

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2.**** shows the word which can not be translated.
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CLAIMS

[Claim(s)]
[Claim 1]
In the liquid membrane formation approach which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,
It is a bonnet about the upper part of said processed substrate that the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick is also,
The liquid membrane formation approach characterized by starting spreading of said drug solution and ending spreading of said drug solution by the periphery side of said direction of a path from the core side of the direction of a path of said processed substrate.
[Claim 2]
In the liquid membrane formation approach which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,
It is a bonnet about the upper part of said processed substrate that the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is also,
The liquid membrane formation approach characterized by starting spreading of said drug solution and ending spreading of said drug solution by the core side of said processed substrate from the periphery side of the direction of a path of said processed substrate.
[Claim 3]
In the liquid membrane formation equipment which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,
A taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick, in the upper part of said processed substrate at the processed substrate side of a wrap lid is formed,
Liquid membrane formation equipment characterized by setting the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone to the core side of said direction of a path, and setting the spreading termination location of said drug solution to the periphery side of said direction of a path.
[Claim 4]
In the liquid membrane formation equipment which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,

A taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin, in the upper part of said processed substrate at the processed substrate side of a wrap lid is formed,
Liquid membrane formation equipment characterized by setting the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone to the periphery side of said direction of a path, and setting the spreading termination location of said drug solution to the core side of said processed substrate.
[Claim 5]
In the liquid membrane formation approach which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,
The liquid-membrane formation approach characterized by to cover the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where of the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick is also, and to make it dry when starting spreading of said drug solution and ending spreading of said drug solution by the periphery side of said direction of a path from the core side of the direction of a path of said processed substrate.
[Claim 6]
In the liquid membrane formation approach which forms liquid membrane on a processed substrate by drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution,
The liquid-membrane formation approach characterized by to cover the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where of the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is also, and to make it dry when starting spreading of said drug solution and ending spreading of said drug solution by the core side of said processed substrate from the periphery side of the direction of a path of said processed substrate.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the liquid membrane formation approach and liquid membrane formation equipment which can attain equalization of the liquid membrane formed on the processed substrate at the detail further about the liquid membrane formation approach and liquid membrane formation equipment which form membranes by applying a drug solution to a processed substrate so that a spiral locus may be drawn.
[0002]
[Description of the Prior Art]
The spin coat method was adopted as the liquid membrane formation approach which applies a drug solution to the front face of a processed substrate at the lithography process in semiconductor device manufacture. However, by this approach, since many drug solutions dispersed from a wafer front face, there was much futility, then it had the influence on the environment by the discharged drug solution. Moreover, in the case of a rectangular substrate or a large circular substrate 12 inches or more, there was a problem that turbulence arose in the periphery section of a substrate and thickness became an ununiformity.
Then, while making thickness into homogeneity from the former or moving a drug solution supply nozzle in the direction of a path to the processed substrate which rotates by JP,2000-288450,A, JP,2000-350955,A, etc. as an approach for lessening the amount of the drug solution to be used, the liquid membrane formation approach applied as draws is adopted [drug solution / locus / spiral] to discharge and its processed substrate in the drug solution.
[0003]
And in case it faces performing the liquid membrane formation and a processed substrate top is moved to the official report concerned, controlling suitably a revolution of the regurgitation of the resist liquid from a drug solution supply nozzle, the drug solution speed of supply in the case of the regurgitation, migration of a drug solution supply nozzle, its passing speed, and a substrate and its rotational speed is indicated.
That is, when moving the drug solution supply nozzle on a substrate, for example about the regurgitation of the drug solution from a drug solution supply nozzle, according to the location on the substrate of a drug solution supply nozzle, he interrupts the regurgitation of a drug solution for the approach of JP,2000-288450,A for the regurgitation of a drug solution in succession, and is trying to aim at equalization of thickness, and the cutback of the amount of the resist used by it. And while a drug solution supply nozzle moves, the drug solution amount of supply is gradually made [many], and he carries out drug solution coverage per unit area ana between a center section and the periphery of a substrate, and is trying to form the uniform film by the approach of JP,2000-350955,A.
[0004]
[Problem(s) to be Solved by the Invention]
However, if a drug solution was applied to a processed substrate, since desiccation of a drug solution would begin from from immediately after applying, the difference in the aridity of a drug solution arose and there was a problem which cannot form uniform liquid membrane by the difference in this

aridity in the location applied to the beginning on a processed substrate, and the location applied to the last.
Then, this invention carries out the object of, preventing generating of the difference in the aridity of the location which applied the drug solution to the beginning on a processed substrate in order to solve the problem mentioned above, and the location which applied the drug solution to the last if possible, and offering the outstanding liquid membrane formation approach which can form the most uniform possible liquid membrane, or liquid membrane formation equipment.
[0005]
[Means for Solving the Problem]
By according to invention which relates to claim 1 in order to attain said object, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution The upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick in the liquid membrane formation approach which forms liquid membrane on a processed substrate is also A bonnet, From the core side of the direction of a path of said processed substrate, spreading of said drug solution is started and it is characterized by ending spreading of said drug solution by the periphery side of said direction of a path.
[0006]
Moreover, according to the liquid membrane formation approach concerning claim 1, desiccation begins from the core side of the direction of a path applied to the beginning on the rotating processed substrate. When the desiccation by the side of the periphery of the direction of a path applied at the end becomes the last, the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thin, and a periphery side is thick is also A wrap, Since the air current which goes to a core side arises from a periphery side, in the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. Since generating of the difference in the aridity by the side of the periphery of the direction of a path which this applied to the last the core side of the direction of a path applied to the beginning on a processed substrate can be prevented if possible, the fluidity of the drug solution of the part applied to the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.
[0007]
Moreover, by according to invention concerning claim 2, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution The upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin in the liquid membrane formation approach which forms liquid membrane on a processed substrate is also A bonnet, From the periphery side of the direction of a path of said processed substrate, spreading of said drug solution is started and it is characterized by ending spreading of said drug solution by the core side of said processed substrate.
[0008]
Moreover, according to the liquid membrane formation approach concerning claim 2, desiccation begins from the periphery side of the direction of a path applied to the beginning on the rotating processed substrate. When the desiccation by the side of the core of the direction of a path applied at the end becomes the last, the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thick, and a periphery side is thin is also A wrap, Since the air current which goes to a periphery side arises from a core side, in the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. Since generating of the difference in the aridity by the side of the core of the

direction of a path which this applied to the last the periphery side of the direction of a path applied to the beginning on a processed substrate can be prevented if possible, the fluidity of the drug solution of the part applied to the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0009]

Moreover, by according to invention concerning claim 3, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation equipment which forms liquid membrane on a processed substrate the upper part of said processed substrate to the processed substrate side of a wrap lid It is characterized by forming a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick, setting the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone to the core side of said direction of a path, and setting the spreading termination location of said drug solution to the periphery side of said direction of a path.

[0010]

Moreover, according to the liquid membrane formation equipment concerning claim 3, desiccation begins from the core side of the direction of a path which is a spreading starting position on the rotating processed substrate. When the desiccation by the side of the periphery of the direction of a path which is a spreading termination location becomes the last, the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thin, and a periphery side is thick is also A wrap, Since the air current which goes to a core side arises from the periphery side of the direction of a path, in the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. Since generating of the difference in the aridity by the side of the periphery of the direction of a path which is a spreading termination location can be prevented if possible by this the core side of the direction of a path which is a spreading starting position on a processed substrate, the fluidity of the drug solution of the part applied to the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0011]

Moreover, by according to invention concerning claim 4, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation equipment which forms liquid membrane on a processed substrate the upper part of said processed substrate to the processed substrate side of a wrap lid A taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is formed. It is characterized by setting the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone to the periphery side of said direction of a path, and setting the spreading termination location of said drug solution to the core side of said processed substrate.

[0012]

Moreover, according to the liquid membrane formation equipment concerning claim 4, desiccation begins from the periphery side of the direction of a path which is a spreading starting position on the rotating processed substrate. When the desiccation by the side of the core of the direction of a path which is a spreading termination location becomes the last, the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thick, and a periphery side is thin is also A wrap, Since the air current which goes to a periphery side arises from the core side of the direction of a path, in the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. Since generating of the difference in the aridity by the side of the core of the direction of a path which is a spreading termination location can be prevented if possible by this the periphery side of the direction of a path

which is a spreading starting position on a processed substrate, the fluidity of the drug solution of the part applied to the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0013]

Moreover, by according to invention concerning claim 5, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation approach which forms liquid membrane on a processed substrate from the core side of the direction of a path of said processed substrate When spreading of said drug solution is started and spreading of said drug solution is ended by the periphery side of said direction of a path, It is characterized by covering the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick is also, and making it dry.

[0014]

Moreover, according to the liquid membrane formation approach concerning claim 5, desiccation begins from the core side of the direction of a path applied to the beginning on the rotating processed substrate. If the upper part of said processed substrate is covered as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thin, and a periphery side is thick is also and it is made to dry when the desiccation by the side of the periphery of the direction of a path applied at the end becomes the last Since the air current which goes to a core side arises from the periphery side of the direction of a path, in the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. If possible, generating of the difference in the aridity by the side of the periphery of the direction of a path which this applied to the last the core side of the direction of a path applied to the beginning on a processed substrate can be prevented, and the most uniform possible liquid membrane can be formed.

[0015]

Moreover, by according to invention concerning claim 6, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation approach which forms liquid membrane on a processed substrate from the periphery side of the direction of a path of said processed substrate When spreading of said drug solution is started and spreading of said drug solution is ended by the core side of said processed substrate, It is characterized by covering the upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is also, and making it dry.

[0016]

Moreover, according to the liquid membrane formation approach concerning claim 6, desiccation begins from the periphery side of the direction of a path applied to the beginning on the rotating processed substrate. If the upper part of said processed substrate is covered as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of the direction of a path is thick, and a periphery side is thin is also and it is made to dry when the desiccation by the side of the core of the direction of a path applied at the end becomes the last Since the air current which goes to a periphery side arises from the core side of the direction of a path, in the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent is made dense. If possible, generating of the difference in the aridity by the side of the core of the direction of a path which this applied to the last the periphery side of the direction of a path applied to the beginning on a processed substrate can be prevented, and the most uniform possible liquid membrane can be formed.

[0017]

[Embodiment of the Invention]

It explains to a detail, carrying out drawing reference hereafter based on the liquid membrane

formation approach concerning this invention, or the operation gestalt materialized per liquid membrane formation equipment. Drawing 1 is the mimetic diagram showing the liquid membrane formation equipment of the gestalt of this operation.

[0018]

The revolution actuator 3 having a revolution drive motor is stationed, and fitting heights 4a to which a rotary table 4 projects caudad is inserted in fitting crevice 3b of revolving-shaft 3a which projects from the revolution actuator 3 to the upper part at the base side of the body 2 of equipment of the spiral coater 1. The disc-like adsorption plate 5 which consists of porosity is formed in the top face of a rotary table 4. Since it is prepared under the adsorption plate 5 so that tube part 5a for attraction may penetrate fitting heights 4a and revolving-shaft 3a in the vertical direction, and the tube part Q1 for attraction which penetrates the wrap processing container supporter Q horizontally connects revolving-shaft 3a with tube part 5a for attraction Through the tube part Q1 for attraction, and tube part 5a for attraction, the adsorption plate 5 carries out vacuum adsorption of the processed substrate 10 with which the aspirator (not shown) was laid on it, and is fixed. Therefore, after centering the processed substrate 10 to revolving-shaft 3a, the rotary table 4 which attracts the processed substrate 10 through the adsorption plate 5 is constituted so that it may rotate with a predetermined rotational speed with the revolution output of the revolution actuator 3.

[0019]

The processing container 6 which has the space in alignment with the configuration of the processed substrate 10 on the processing container supporter Q is supported, and the processing container 6 has become the configuration which wraps in a rotary table 4 and the processed substrate 10 on it. And slit 6s for dropping a drug solution to lid 6a of the processing container 6 from on the to the processed substrate 10 is formed in the direction of a path. Slit 6s, to the location which serves as a diameter of the outermost of liquid membrane from the core of a rotary table 4, i.e., the core of the laid processed substrate, it cuts in the shape of a straight line, and lacks.

[0020]

In the body 2 of equipment, the drug solution supply nozzle 8 as a drug solution feed zone for applying a drug solution to the processed substrate 10 is formed movable, and this drug solution supply nozzle 8 is constituted on the processing container 6 so that it can move in the slit 6s top which met in the direction of a path of the processed substrate 10. The revolving shaft 13 connected with the slide rail 11 and the nozzle migration motor 12 is specifically installed, and in order to slide on the slide rail 11 and to carry out a straight-line reciprocating motion, between the drug solution supply nozzle 8 and the revolving shaft 13, the ball screw and the magnetic screw which change the turning effort of the nozzle migration motor 12 into the rectilinear motion of the drug solution supply nozzle 8 are constituted.

[0021]

The drug solution supply nozzle 8 is connected by Tubes 17a and 17b through the drug solution feed pump 16 to the drug solution tank 15 which held the drug solution. This drug solution feed pump 16 supplies a drug solution to the drug solution supply nozzle 8 by the predetermined pressure from the drug solution tank 15 by operating the diaphram 21 formed on the pump house 25 with the pneumatic pressure from the air pressure supply valve 18. The pressure sensor 22 which detects the discharge pressure of a drug solution is built in the drug solution feed pump 16, and the drug solution supply isolation valve 23 and the drug solution blowdown isolation valve 24 for storing a drug solution in a pump house 25, and supplying by place constant pressure are prepared in the input side and output side of a pump house 25, respectively. The drug solution of the stable jet will be breathed out from the drug solution supply nozzle 8 to the processed substrate 10 by such configuration.

[0022]

The spiral coater 1 makes a parameter the rotational frequency of the processed substrate 10, the passing speed of the drug solution supply nozzle 8, and the drug solution speed of supply (discharge pressure of a drug solution) from the drug solution supply nozzle 8. It is constituted so that these may be controlled simultaneously, and the revolution actuator 3 is received. The controller 31 for a revolution To the nozzle migration motor 12, the controller 33 for pumps is connected to the air pressure supply valve 18 and the pressure sensor 22 for the controller 32 for nozzle migration again, respectively. And while a drug solution is supplied on a processed substrate, the rotational frequency

of the processed substrate 10, the actuation rate of the drug solution supply nozzle 8, and the drug solution speed of supply from the drug solution supply nozzle 8 are managed by each controllers 31, 32, and 33, but the Maine controller 30 is further connected to these, and it is constituted so that generalization management can be carried out.

[0023]

In the case of the spiral coater 1, the so-called spiral spreading which applies spirally the drug solution of the detailed jet breathed out from the drug solution supply nozzle 8 to the rotating processed substrate 10 is performed. Therefore, a revolution is given to a rotary table 4 by the revolution actuator 3, and the processed substrate 10 held at the adsorption plate 5 rotates with a rotational speed predetermined [according to the output of the revolution actuator 3] at the time of activation of spiral spreading. Moreover, since the drug solution from which the drug solution in the drug solution tank 15 was fed by the drug solution feed pump 16 to the drug solution supply nozzle 8, and became the detailed jet of a predetermined speed of supply by it is breathed out by directly under from the drug solution supply nozzle 8, a drug solution is supplied on the processed substrate 10 through slit 6s, while it is breathed out without becoming a thin elementary stream and breaking off and the drug solution supply nozzle 8 moves relatively to the processed substrate 10.

[0024]

Supply of the drug solution to the processed substrate 10 is performed in case the drug solution supply nozzle 8 moves towards a periphery side to a core side towards a periphery side from the core side. The revolution will be changed into the rectilinear motion of the drug solution supply nozzle 8 by non-illustrated a ball screw and a magnetic screw, if migration of the drug solution supply nozzle 8 is performed by actuation of the nozzle migration motor 12 and a revolution is given to a revolving shaft 13. Therefore, the drug solution supply nozzle 8 moves, without breaking down the position in which slide on the slide rail 11 and a delivery becomes right under about the slit 6s upper part. And although the drug solution supply nozzle 8 is evacuated in addition to processed substrate 10 and the regurgitation of a drug solution is ended after termination of spreading of the processed substrate 10 whole surface by the drug solution supply nozzle 8, in order to make liquid membrane on the processed substrate 10 into homogeneity, leveling processing is performed by continuing a revolution further after termination of spreading.

[0025]

Although drawing 2 is image drawing of spiral spreading, if a drug solution is breathed out from the drug solution supply nozzle 8 which moves in the direction of a path to the rotating processed substrate 10 at the time of liquid membrane formation, the drug solution of a detailed jet becomes an elementary stream, and sequential supply of it is carried out at the curled form so that it may illustrate on the processed substrate 10. And the drug solutions which spread and adjoin combine the drug solution supplied to the curled form, and one liquid membrane is formed on the processed substrate 10.

Drawing 3 is the sectional view expanding and showing the configuration in the processing container 6, and revolution actuator 3 grade. Taper side 6z from which 6x are thin the core side of said direction of a path, and periphery side 6y of said direction of a path becomes a thick cross-section configuration about the upper part of the processed substrate 10 at the processed substrate 10 side of wrap lid 6a is formed. Therefore, as for periphery side 6y of the direction of a path of lid 6a, small space (space die-length L2=3.5mm) will be formed on the processed substrate 10 to the space (space die-length L1=5.5mm) on the processed substrate 10 where 6x are large being formed the core side of the direction of a path of lid 6a. In this case, the distance from the core of the direction of a path of lid 6a to the outermost periphery of the direction of a path is about 120mm, and the small space on the processed substrate 10 (space die-length L2=3.5mm) turns into about 60 percent of the large space on the processed substrate 10 (space die-length L1=5.5mm).

[0026]

Drawing 4 is image drawing showing the flow of the air current in the case of drawing 3 etc. When taper side 6z which goes down to the processed substrate 10 side of lid 6a from 6x toward periphery side 6y a core side is formed, the spreading starting position which carries out the regurgitation of the drug solution from the drug solution supply nozzle 8 is set as core side 10a of said direction of a path of the processed substrate 10, and the spreading termination location of a drug solution is set as

periphery side 10b of the direction of a path of the processed substrate 10. Then, since the air current K1 which goes to core side 10a arises from periphery side 10b in the drug solution which volatilizes from the processed substrate 10 as shown in drawing 4 , the dense part K2 of the ambient atmosphere of a solvent will be formed [above core side 10a of the direction of a path on the processed substrate 10]. Consequently, since generating of the time difference in the aridity of core side 10a of the direction of a path applied to the beginning on the processed substrate 10 and periphery side 10b of the direction of a path applied to the last can be prevented if possible, the fluidity of the drug solution on the processed substrate 10 can be especially secured in core side 10a of the direction of a path and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0027]

Although a plate-like case is shown in drawing 5 when not forming taper side 6z in the processed substrate 10 side of wrap lid 6a for the upper part of the processed substrate 10 here namely, the sign same about the same member as drawing 3 is attached, and the explanation is omitted. In this case, as shown in drawing 5 , periphery side 6y of the direction of a path will be covered from 6x the core side of the direction of a path of lid 6a, and the space (space die-length L3=3.5mm) of constant width will be formed on the processed substrate 10. Concentration distribution is shown in drawing 6 at the time of drug solution spreading between processed substrate 10 absentminded [in that case]. Drawing 6 expresses the location from the spreading starting position (0mm) on the processed substrate 10 to a spreading termination location (about a maximum of 100mm) with an axis of abscissa, the distance (about a maximum of 3.0mm) which tends toward an axis of ordinate upwards from the processed substrate 10 is expressed, and the graph expresses the distribution at the time of tying the point of the same concentration of the drug solution which volatilized. Although a drug solution is for applying the organic solvent including an organic solvent, when applied on the processed substrate 10, there is a property to volatilize.

According to this graph, it turns out that there is a shade in concentration distribution toward a spreading termination location (100mm) from a spreading starting position (0mm) at the time of drug solution spreading, and there is a shade toward the upper part from the processed substrate 10, and desiccation begins from a spreading starting position (0mm), this is a spreading termination location (100mm), and it means that desiccation becomes the last.

[0028]

In this way, although the desiccation clearance process that the liquid membrane on the formed processed substrate 10 carries out desiccation clearance of the solvent which is in liquid membrane after that is performed, the thickness of liquid membrane becomes thin according to the desiccation clearance process. Here, the condition of the thickness of the liquid membrane after a desiccation clearance process is shown in drawing 7 and drawing 8 . Drawing 7 shows the relation between the location from a spreading starting position (0mm) in case wrap lid 6a is plate-like about the upper part of the processed substrate 10 to a spreading termination location (100mm), and the thickness on the processed substrate 10. Drawing 8 shows the relation between the location from the spreading starting position (0mm) in the case of forming taper side 6z in the processed substrate 10 side of wrap lid 6a for the upper part of the processed substrate 10 to a spreading termination location (100mm), and the thickness on the processed substrate 10 to it.

According to it, drawing 8 has few up-and-down deflections on the basis of 4000A of thickness to drawing 7 having a deflection greatly up and down on the basis of 4000A of thickness. As opposed to swaying the upper part of the processed substrate 10 greatly up and down on the basis of 4000A of thickness, when wrap lid 6a is plate-like (refer to drawing 7), and whose thickness not being [this] uniform When forming taper side 6z in the processed substrate 10 side of wrap lid 6a for the upper part of the processed substrate 10 (refer to drawing 8), on the basis of 4000A of thickness, there are few up-and-down deflections and it means that thickness is uniform compared with the case where it is drawing 7 .

[0029]

Since taper side 6z is formed in the processed substrate 10 side of wrap lid 6a, such a result the upper part of the processed substrate 10 to the drug solution which volatilizes from the processed substrate 10 Since the air current K1 which goes to core side 10a arises from periphery side of direction of

path 10b, it sets above core side 10a of the direction of a path on (refer to drawing 4) and the processed substrate 10. The dense part K2 of the ambient atmosphere of a solvent is formed, and it sets to core side 10a of the direction of a path especially. As opposed to securing the fluidity of the drug solution of the part applied to the beginning on a processed substrate, and being able to guess that the solid content in a drug solution can be distributed In the case of the plate which does not form taper side 6z in the processed substrate 10 side of wrap lid 6a, the upper part of the processed substrate 10 can be guessed that such a phenomenon does not arise.
After breathing out a drug solution from the drug solution supply nozzle 8 and applying a drug solution to the processed substrate 10, where the upper part of the processed substrate 10 is covered by lid 6a, carrying out a fixed time amount revolution of the processed substrate 10 is continued further, and leveling to which only fixed time amount changes the number of revolutions in the state of an open beam in lid 6a is performed. Then, although the processed substrate 10 is moved in the dry room H1 shown in drawing 9 , is baked and is dried, an organic solvent will fall out by baking. Drawing 9 is image drawing showing the inside of a dry room H1.
[0030]
As shown in drawing 9 , it is the closed space which equips the base section with a heater H2, and the heat insulation supporting material H3 is formed on a heater H2, and, as for drying room H1, the processed substrate 10 is supported on the heat insulation supporting material H3 so that a heater H2 and the processed substrate 10 may not contact directly. The space (height of about 5mm) which is extent around which a solvent ambient atmosphere does not turn is established in the processed substrate 10 bottom. In this case, since spreading of a drug solution is started and spreading of said drug solution is ended by the periphery side of said direction of a path from the core side of the direction of a path of the processed substrate 10, drying room H1 covers the upper part of said processed substrate 10 as lid 6a which formed in processed substrate side 10 taper side 6z from which 6x are thin the core side of the direction of a path, and periphery side 6y of the direction of a path becomes a thick cross-section configuration is also, and is dried.
If the upper part of said processed substrate 10 is covered as such lid 6a is also, and it is made to dry, since the air current K1 which goes to core side 10a will arise from periphery side of direction of path 10b, the part K2 to which the ambient atmosphere of a solvent becomes dense is formed [above core side 10a of the direction of a path which is a spreading starting position]. And when the upper solvent ambient atmosphere of the processed substrate 10 is a saturation state, if possible, generating of the difference in the aridity of core side 10a of the direction of a path especially applied to the core side of the direction of a path at the beginning on the processed substrate 10 and periphery side 10b of the direction of a path applied to the last can be prevented, and the most uniform possible liquid membrane can be formed.
[0031]
By according to the gestalt of this operation, drawing a spiral locus for a drug solution on discharge and the processed substrate 10 from the drug solution supply nozzle 8 which moves in the direction of a path in a it top to the rotating processed substrate 10, and applying a drug solution, as explained above In the spiral coater 1 which forms liquid membrane on the processed substrate 10 the upper part of the processed substrate 10 to the processed substrate 10 side of wrap lid 6a Taper side 6z from which 6x are thin the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thick cross-section configuration is formed. Since the spreading starting position which carries out the regurgitation of said drug solution from said drug solution supply nozzle 8 is set as core side 10a of said direction of a path of said processed substrate 10 and the spreading termination location of a drug solution is set as periphery side 10b of the direction of a path of said processed substrate 10 If the upper part of said processed substrate 10 is covered as said lid 6a is also and it is made to dry when desiccation begins from core side of direction of path which is spreading starting position 10a and desiccation of periphery side 10b of the direction of a path which is a spreading termination location becomes the last Since the air current K1 which goes to core side 10a arises from periphery side 10b, the dense part K2 is formed in the ambient atmosphere of a solvent [above core side 10a of the direction of a path which is a spreading starting position]. Since generating of the time difference in the aridity of core side 10a of the direction of a path which is a spreading starting position on the processed substrate 10, and periphery side 10b of the direction of a

path which is a spreading termination location can be prevented if possible by this, the fluidity of the drug solution of the part applied to the beginning on the processed substrate 10 can be secured and the solid content in a drug solution can be distributed with leveling, the most uniform possible liquid membrane can be formed.

[0032]

Next, the gestalt of other operations is explained with reference to drawing 10 thru/or drawing 12 . Drawing 10 is the sectional view expanding and showing the important section of the liquid membrane formation equipment of the gestalt of other operations, drawing 11 is image drawing showing the flow of the air current in the case of drawing 10 etc., and drawing 12 is image drawing showing the inside of a dry room. The sign respectively same about the member same about the member shown in drawing 10 thru/or drawing 12 as the member shown in drawing 3 , drawing 4 , and drawing 9 is attached, and detailed explanation is omitted. Taper side 6w from which 6x are thick the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thin cross-section configuration about the upper part of the processed substrate 10 at the processed substrate 10 side of wrap lid 6a is formed. Therefore, as for periphery side 6y of the direction of a path of lid 6a, large space (space die-length L5=3.5mm) will be formed on the processed substrate 10 to the space (space die-length L4=1.5mm) where 6x are small on the processed substrate 10 being formed the core side of the direction of a path of lid 6a.

[0033]

Thus, when taper side 6w which goes down to the processed substrate 10 side of lid 6a from periphery side of direction of path 6y toward 6x a core side is formed, If the spreading starting position which carries out the regurgitation of the drug solution from the drug solution supply nozzle 8 is set as periphery side 10b of said direction of a path of said processed substrate 10 and the spreading termination location of said drug solution is set as core side 10a of the direction of a path of said processed substrate 10, as shown in drawing 11 Since the air current K3 which goes to periphery side 10b arises from core side 10a, the dense part K4 of the ambient atmosphere of a solvent is formed in the drug solution which volatilizes from the processed substrate 10 [above periphery side 10b of the direction of a path on the processed substrate 10].

[0034]

Thus, if the dense part K4 of the ambient atmosphere of the solvent above periphery side 10b of the direction of a path is formed, if possible, generating of the time difference in the aridity of periphery side 10b of the direction of a path which is a spreading starting position on the processed substrate 10, and core side 10a of the direction of a path which is a spreading termination location can be prevented. Therefore, since the fluidity of the drug solution on the processed substrate 10 can be secured and the solid content in a drug solution can be especially distributed with leveling in periphery side 10b of the direction of a path, it is guessed that the most uniform possible liquid membrane can be formed.

[0035]

Moreover, after breathing out a drug solution from the drug solution supply nozzle 8 and applying a drug solution, the processed substrate 10 is moved in the dry room H1 shown in drawing 12 , is baked, and is dried. Drying room H1 serves as a closed space which equips the base section with a heater H2, the heat insulation supporting material H3 is formed on a heater H2, and the processed substrate 10 is supported on the heat insulation supporting material H3. Since spreading of a drug solution is started and spreading of a drug solution is ended by core side 10a of the processed substrate 10 from periphery side 10b of the direction of a path of the processed substrate 10, in this case, drying room H1 The upper part of the processed substrate 10 is covered as lid 6a which formed in the processed substrate 10 side taper side 6w from which 6x are thick the core side of the direction of a path, and periphery side 6y of the direction of a path becomes a thin cross-section configuration is also, and it is made to dry.

If the upper part of said processed substrate 10 is covered as lid 6a equipped with such taper side 6w is also, and it is made to dry, since the air current K3 which goes to periphery side 10b will arise from core side of direction of path 10a, the part K4 to which the ambient atmosphere of a solvent becomes dense is formed [above periphery side 10b of the direction of a path which is a spreading starting position]. Thereby, if possible, generating of the time difference in the aridity of periphery

side 10b of the direction of a path which is a spreading starting position on the processed substrate 10, and core side 10a of the direction of a path which is a spreading termination location can be prevented. And since the fluidity of the drug solution on the processed substrate 10 can be secured and the solid content in a drug solution can be especially distributed in periphery side 10b of the direction of a path, the most uniform possible liquid membrane can be formed.

[0036]

By according to the gestalt of other operations, drawing a spiral locus for a drug solution on discharge and the processed substrate 10 from the drug solution supply nozzle 8 which moves in the direction of a path in a it top to the rotating processed substrate 10, and applying a drug solution, as explained above In the spiral coater 1 which forms liquid membrane on the processed substrate 10 the upper part of said processed substrate 10 to the processed substrate 10 side of wrap lid 6a Taper side 6w from which 6x are thick the core side of said direction of a path, and periphery side 6y of said direction of a path becomes a thin cross-section configuration is formed. The spreading starting position which carries out the regurgitation of said drug solution from said drug solution supply nozzle 8 is set as periphery side 10b of said direction of a path, and the spreading termination location of said drug solution is set as core side 10a of said processed substrate 10. Desiccation begins from periphery side of direction of path which is spreading starting position on rotating processed substrate 10 10b by that cause. When desiccation of core side 10a of the direction of a path which is a spreading termination location becomes the last, The upper part of said processed substrate 10 as lid 6a which formed in the processed substrate 10 side a taper side where 6x are thick the core side of the direction of a path, and periphery side 6y becomes a thin cross-section configuration is also A wrap, Since the air current K3 which goes to periphery side 10b arises from core side 10a, the dense part K4 is formed in the ambient atmosphere of a solvent [above periphery side 10b of the direction of a path which is a spreading starting position]. Thereby, if possible, generating of the time difference in the aridity of periphery side 10b of the direction of a path which is a spreading starting position on the processed substrate 10, and core side 10a of the direction of a path which is a spreading termination location can be prevented. And since the fluidity of the drug solution on the processed substrate 10 can be secured and the solid content in a drug solution can be especially distributed in periphery side 10b of the direction of a path, the most uniform possible liquid membrane can be formed.

[0037]

In addition, lid 6a in which taper side 6w from which 6x are thick the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thin cross-section configuration was formed, The taper side by the side of the processed substrate 10 does not pass over lid 6a in which taper side 6z from which 6x are thin the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thick cross-section configuration was formed to differ, in addition since it is the same configuration, it can exchange lid 6a if needed. By that cause, while setting a spreading starting position as core side 10a of the direction of a path of the processed substrate 10 When the spreading termination location of a drug solution is set as periphery side 10b of the direction of a path of the processed substrate 10, it sets at a desiccation process. While setting a spreading starting position as periphery side 10b of the direction of a path of the processed substrate 10 to using lid 6a in which taper side 6z from which 6x are thin the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thick cross-section configuration was formed When the spreading termination location of a drug solution is set as core side 10a of the direction of a path of the processed substrate 10, in a desiccation process, lid 6a in which taper side 6w from which 6x are thick the core side of the direction of a path, and periphery side 6y of said direction of a path becomes a thin cross-section configuration was formed can be used.

In addition, the gestalt of operation of this invention is applicable not only to the example mentioned above but various gestalten. For example, although applied to processed substrates, such as a semi-conductor wafer manufactured with semiconductor fabrication machines and equipment, with the gestalt of operation, it is applicable to another processed substrate etc.

[0038]

[Effect of the Invention]

By according to invention concerning claim 1, drawing a spiral locus for a drug solution on

discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution as explained above The upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick in the liquid membrane formation approach which forms liquid membrane on a processed substrate is also A bonnet, Since spreading of said drug solution is started and spreading of said drug solution is ended by the periphery side of said direction of a path from the core side of the direction of a path of said processed substrate Since the air current which goes the upper part of said processed substrate to a core side from a periphery side with a wrap as said lid is also arises when the desiccation by the side of the periphery of the direction of a path which desiccation began from the core side of the direction of a path applied first, and was applied at the end becomes the last In the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. If possible, generating of the difference in the aridity by the side of the periphery of the direction of a path which this applied to the last the core side of the direction of a path applied to the beginning on a processed substrate can be prevented. And since the fluidity of the drug solution of the part especially applied to the core side of the direction of a path at the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0039]

Moreover, by according to invention concerning claim 2, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution The upper part of said processed substrate as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin in the liquid membrane formation approach which forms liquid membrane on a processed substrate is also A bonnet, Since spreading of said drug solution is started and spreading of said drug solution is ended by the core side of said processed substrate from the periphery side of the direction of a path of said processed substrate Since the air current which goes the upper part of said processed substrate to a periphery side from the wrap and core side of the direction of a path as said lid is also arises when the desiccation by the side of the core of the direction of a path which desiccation began from the periphery side of the direction of a path applied first, and was applied at the end becomes the last In the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. If possible, generating of the difference in the aridity by the side of the core of the direction of a path which this applied to the last the periphery side of the direction of a path applied to the beginning on a processed substrate can be prevented. And since the fluidity of the drug solution of the part especially applied to the periphery side of the direction of a path at the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0040]

Moreover, by according to invention concerning claim 3, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation equipment which forms liquid membrane on a processed substrate the upper part of said processed substrate to the processed substrate side of a wrap lid A taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick is formed. Since the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone is set to the core side of said direction of a path and the spreading termination location of said drug solution is set to the periphery side of said direction of a path Since the air current which goes the upper part of said processed substrate to a core side from a periphery side with a wrap as said lid is also arises when desiccation begins from the core side of the direction of a path which is a spreading starting position and the desiccation by the side of the periphery of the direction of a path which is a

spreading termination location becomes the last In the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. Thereby, if possible, generating of the difference in the aridity by the side of the periphery of the direction of a path which is a spreading termination location can be prevented the core side of the direction of a path which is a spreading starting position on a processed substrate. And since the fluidity of the drug solution of the part especially applied to the core side of the direction of a path at the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0041]

Moreover, by according to invention concerning claim 4, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation equipment which forms liquid membrane on a processed substrate the upper part of said processed substrate to the processed substrate side of a wrap lid A taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is formed. Since the spreading starting position which carries out the regurgitation of said drug solution from said drug solution feed zone is set to the periphery side of said direction of a path and the spreading termination location of said drug solution is set to the core side of said processed substrate When desiccation begins from the periphery side of the direction of a path which is a spreading starting position and the desiccation by the side of the core of the direction of a path which is a spreading termination location becomes the last, the upper part of said processed substrate as said lid is also A wrap, Since the air current which goes to a periphery side arises from the core side of the direction of a path, in the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. Thereby, if possible, generating of the difference in the aridity by the side of the core of the direction of a path which is a spreading termination location can be prevented the periphery side of the direction of a path which is a spreading starting position on a processed substrate. And since the fluidity of the drug solution of the part especially applied to the periphery side of the direction of a path at the beginning on a processed substrate can be secured and the solid content in a drug solution can be distributed, the most uniform possible liquid membrane can be formed.

[0042]

Moreover, by according to invention concerning claim 5, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the liquid membrane formation approach which forms liquid membrane on a processed substrate from the core side of the direction of a path of said processed substrate When spreading of said drug solution is started and spreading of said drug solution is ended by the periphery side of said direction of a path, Since the upper part of said processed substrate is covered as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thin, and the periphery side of said direction of a path is thick is also, and it is made to dry If desiccation begins from the core side of the direction of a path applied first, the desiccation by the side of the periphery of the direction of a path applied at the end becomes the last, and the upper part of said processed substrate is covered as said lid is also, and it is made to dry Since the air current which goes to a core side arises from the periphery side of the direction of a path, in the upper part by the side of the core of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. If possible, generating of the difference in the aridity by the side of the periphery of the direction of a path which this applied to the last the core side of the direction of a path applied to the beginning on a processed substrate can be prevented, and the most uniform possible liquid membrane can be formed.

[0043]

Moreover, by according to invention concerning claim 6, drawing a spiral locus for a drug solution on discharge and a processed substrate from the drug solution feed zone which moves in the direction of a path in a it top to the rotating processed substrate, and applying a drug solution In the

liquid membrane formation approach which forms liquid membrane on a processed substrate from the periphery side of the direction of a path of said processed substrate When spreading of said drug solution is started and spreading of said drug solution is ended by the core side of said processed substrate, Since the upper part of said processed substrate is covered as the lid which formed in the processed substrate side a taper side which serves as the cross-section configuration where the core side of said direction of a path is thick, and the periphery side of said direction of a path is thin is also, and it is made to dry If desiccation begins from the periphery side of the direction of a path applied first, the desiccation by the side of the core of the direction of a path applied at the end becomes the last, and the upper part of said processed substrate is covered as said lid is also, and it is made to dry Since the air current which goes to a periphery side arises from the core side of the direction of a path, in the upper part by the side of the periphery of the direction of a path which is a spreading starting position, the ambient atmosphere of a solvent becomes dense. If possible, generating of the difference in the aridity by the side of the core of the direction of a path which this applied to the last the periphery side of the direction of a path applied to the beginning on a processed substrate can be prevented, and the most uniform possible liquid membrane can be formed.

[Brief Description of the Drawings]

[Drawing 1] It is the mimetic diagram showing the whole liquid membrane formation equipment of the gestalt of this operation.

[Drawing 2] It is image drawing of spiral spreading.

[Drawing 3] It is the sectional view expanding and showing the important section of the liquid membrane formation equipment of the gestalt of this operation.

[Drawing 4] It is image drawing showing the flow of the air current in the case of drawing 3 etc.

[Drawing 5] It is an expanded sectional view about the general liquid membrane formation equipment important section shown for a comparison.

[Drawing 6] It is drawing showing concentration distribution at the time of drug solution spreading in the case of drawing 5 .

[Drawing 7] It is the graphical representation showing the relation of the thickness and the location which were formed with the equipment of drawing 5 .

[Drawing 8] It is the graphical representation showing the relation of the thickness and the location which were formed with the equipment of drawing 3 .

[Drawing 9] It is image drawing showing a dry room.

[Drawing 10] It is the sectional view expanding and showing the important section of the liquid membrane formation equipment of the gestalt of other operations.

[Drawing 11] It is image drawing showing the flow of the air current in the case of drawing 10 etc.

[Drawing 12] It is image drawing showing a dry room.

[Description of Notations]

1 Spiral Coater (Liquid Membrane Formation Equipment)
2 Body of Equipment
3 Revolution Actuator
4 Rotary Table
6 Processing Container
6s Slit
6a Lid
6x Core side of the direction of a path of a lid
6y Periphery side of the direction of a path of a lid
6z Taper side
6w Taper side
8 Drug Solution Supply Nozzle (Drug Solution Feed Zone)
10 Processed Substrate
10a Core side of the direction of a path
10b Periphery side of the direction of a path
K1 Air current
K2 Dense part of a solvent ambient atmosphere

K3 Air current
K4 Dense part of a solvent ambient atmosphere

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the mimetic diagram showing the whole liquid membrane formation equipment of the gestalt of this operation.
[Drawing 2] It is image drawing of spiral spreading.
[Drawing 3] It is the sectional view expanding and showing the important section of the liquid membrane formation equipment of the gestalt of this operation.
[Drawing 4] It is image drawing showing the flow of the air current in the case of drawing 3 etc.
[Drawing 5] It is an expanded sectional view about the general liquid membrane formation equipment important section shown for a comparison.
[Drawing 6] It is drawing showing concentration distribution at the time of drug solution spreading in the case of drawing 5 .
[Drawing 7] It is the graphical representation showing the relation of the thickness and the location which were formed with the equipment of drawing 5 .
[Drawing 8] It is the graphical representation showing the relation of the thickness and the location which were formed with the equipment of drawing 3 .
[Drawing 9] It is image drawing showing a dry room.
[Drawing 10] It is the sectional view expanding and showing the important section of the liquid membrane formation equipment of the gestalt of other operations.
[Drawing 11] It is image drawing showing the flow of the air current in the case of drawing 10 etc.
[Drawing 12] It is image drawing showing a dry room.
[Description of Notations]
1 Spiral Coater (Liquid Membrane Formation Equipment)
2 Body of Equipment
3 Revolution Actuator
4 Rotary Table
6 Processing Container
6s Slit
6a Lid
6x Core side of the direction of a path of a lid
6y Periphery side of the direction of a path of a lid
6z Taper side
6w Taper side
8 Drug Solution Supply Nozzle (Drug Solution Feed Zone)
10 Processed Substrate
10a Core side of the direction of a path
10b Periphery side of the direction of a path
K1 Air current
K2 Dense part of a solvent ambient atmosphere
K3 Air current
K4 Dense part of a solvent ambient atmosphere

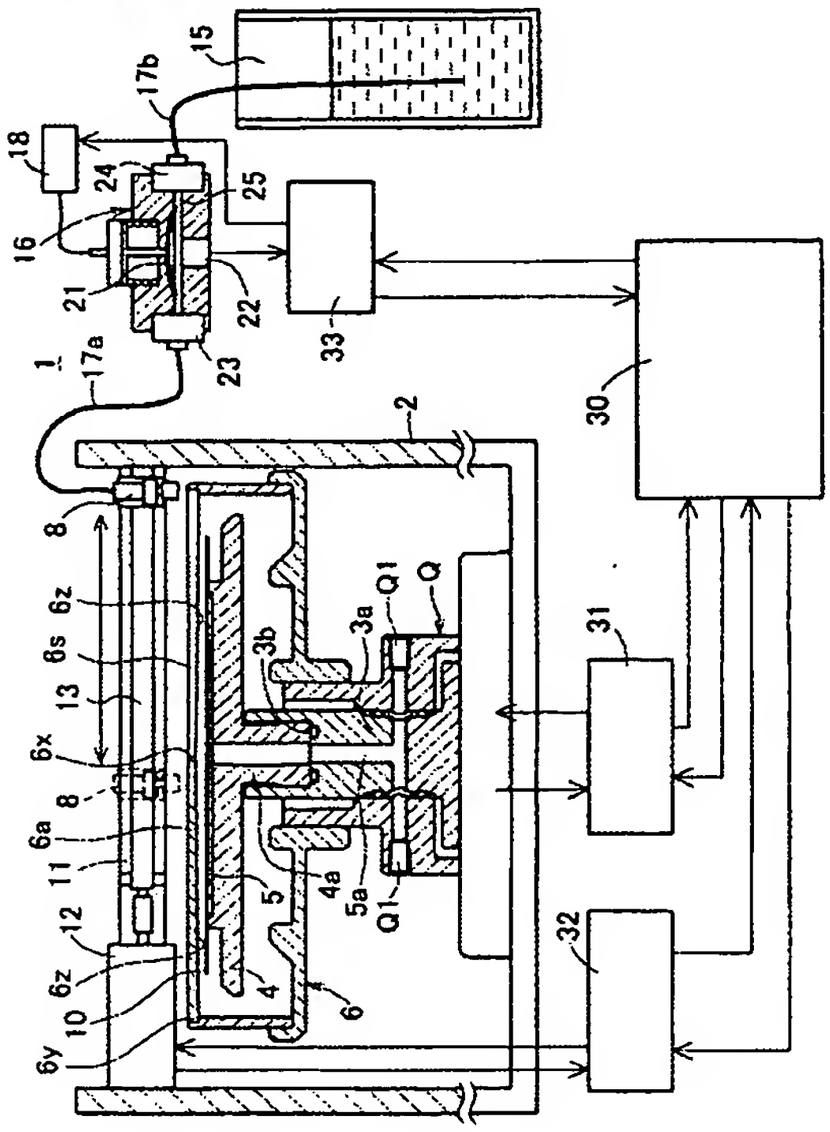
[Translation done.]

* NOTICES *

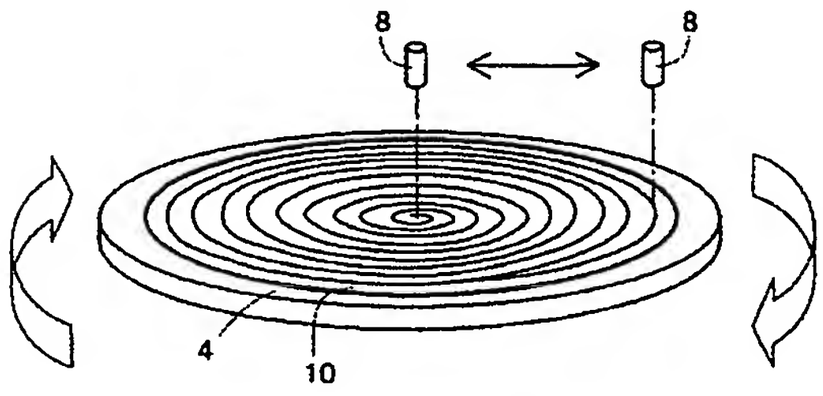
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

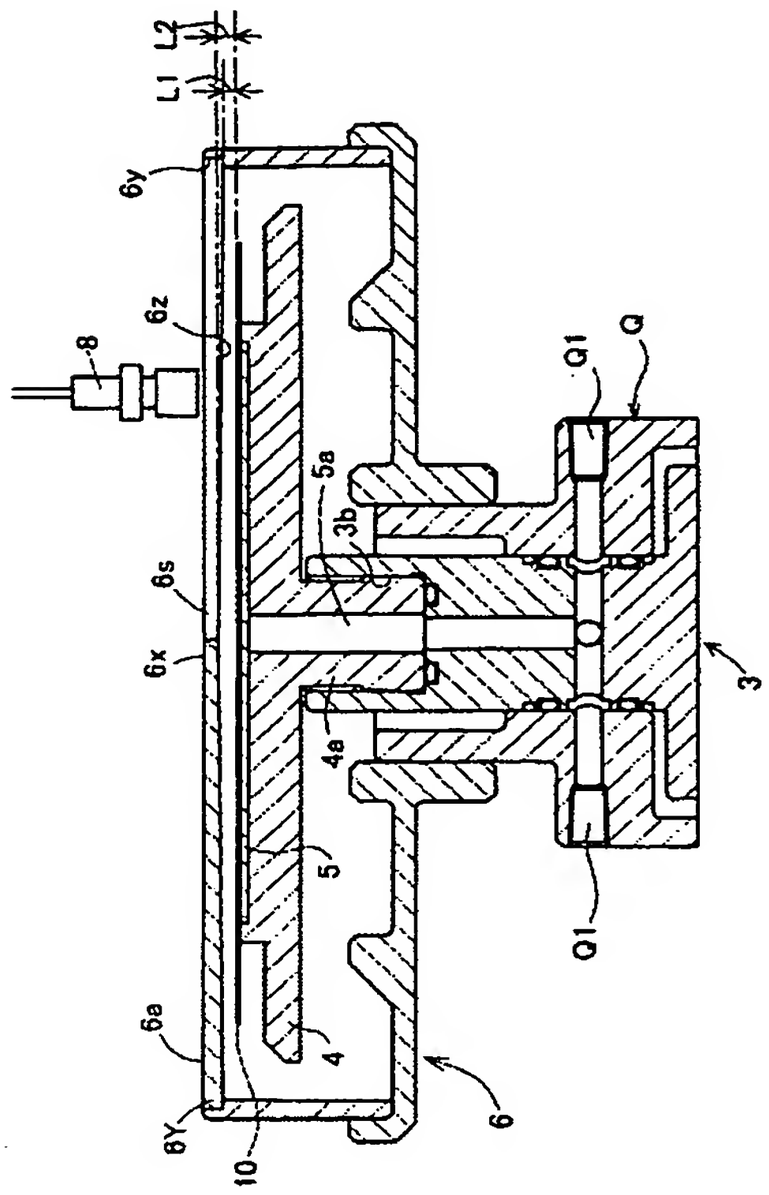
[Drawing 1]



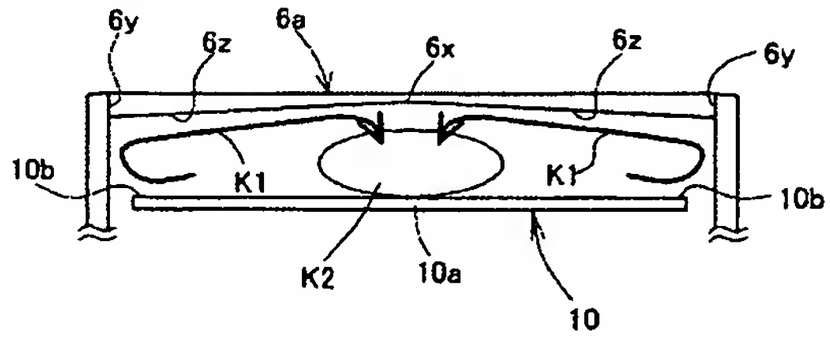
[Drawing 2]



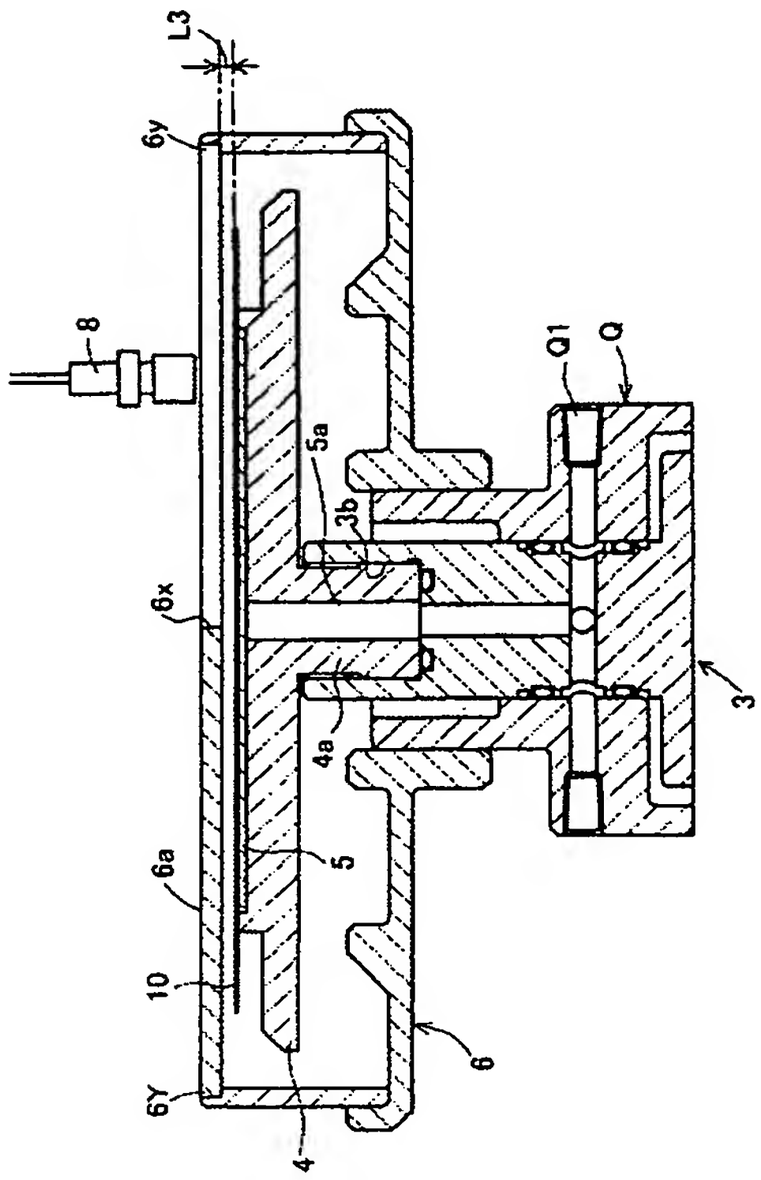
[Drawing 3]



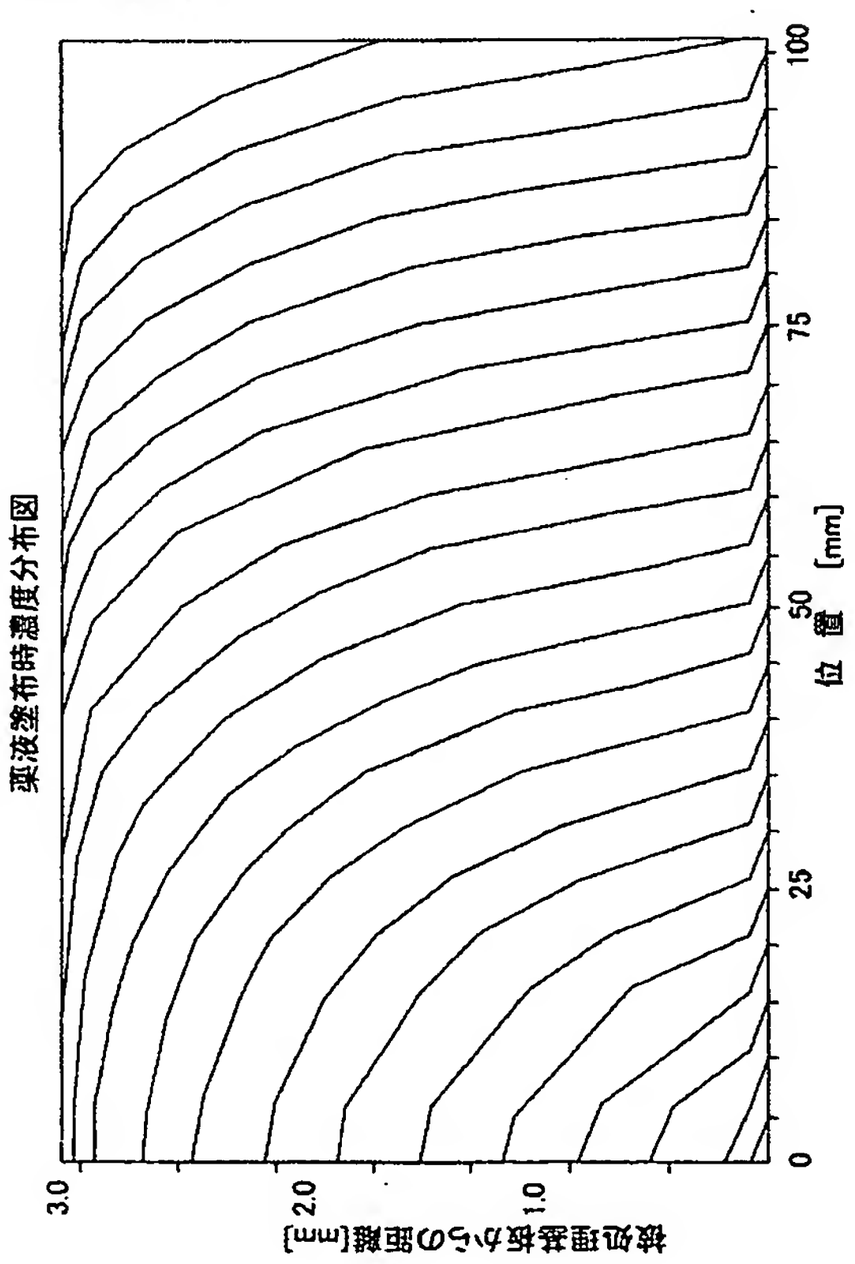
[Drawing 4]



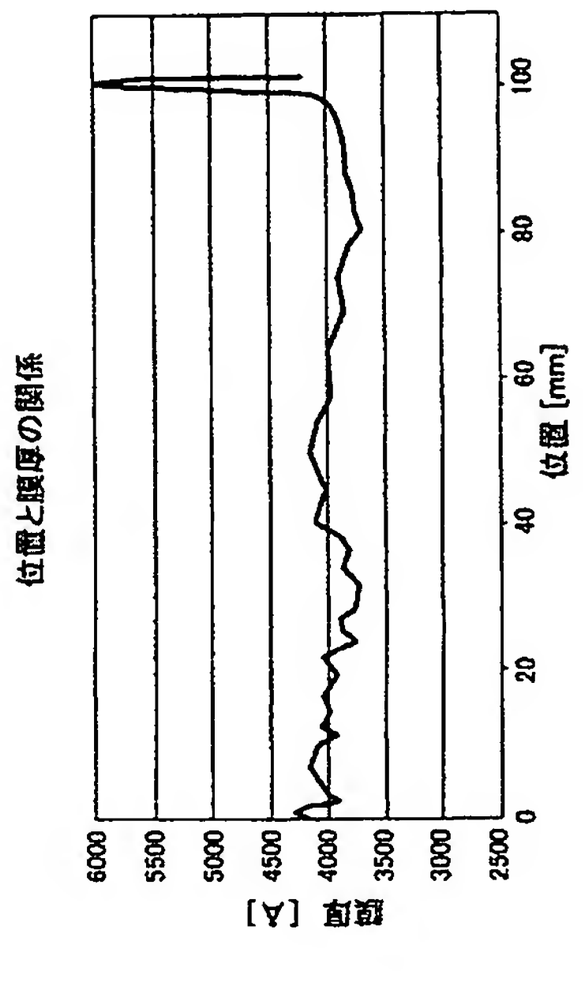
[Drawing 5]



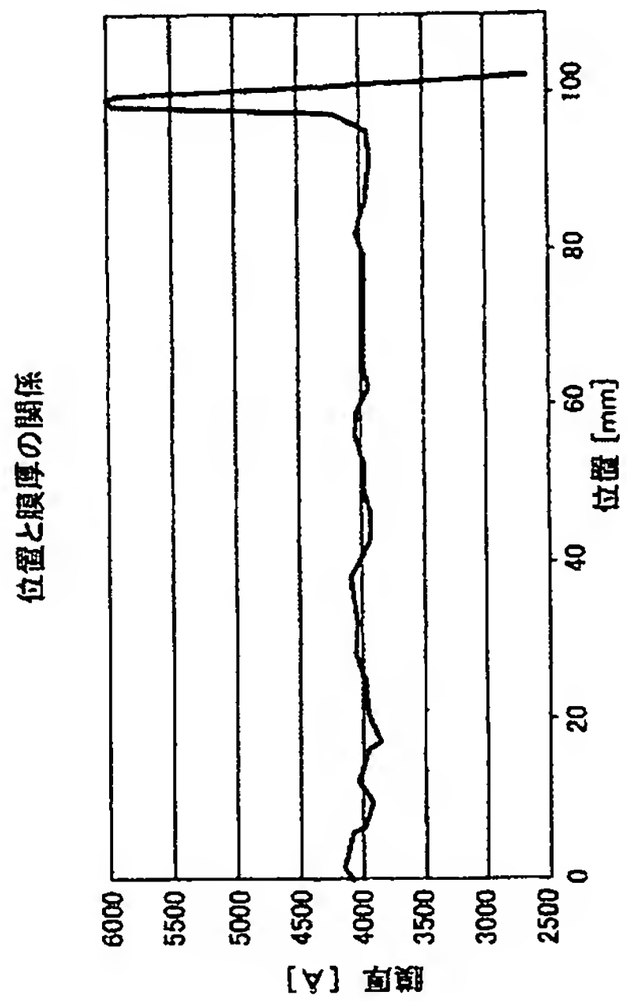
[Drawing 6]



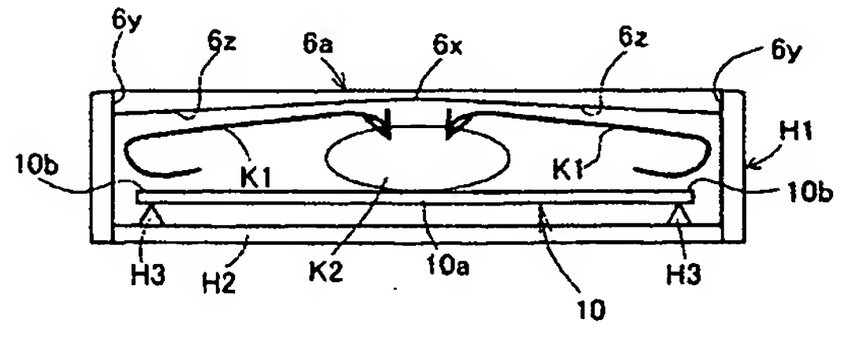
[Drawing 7]



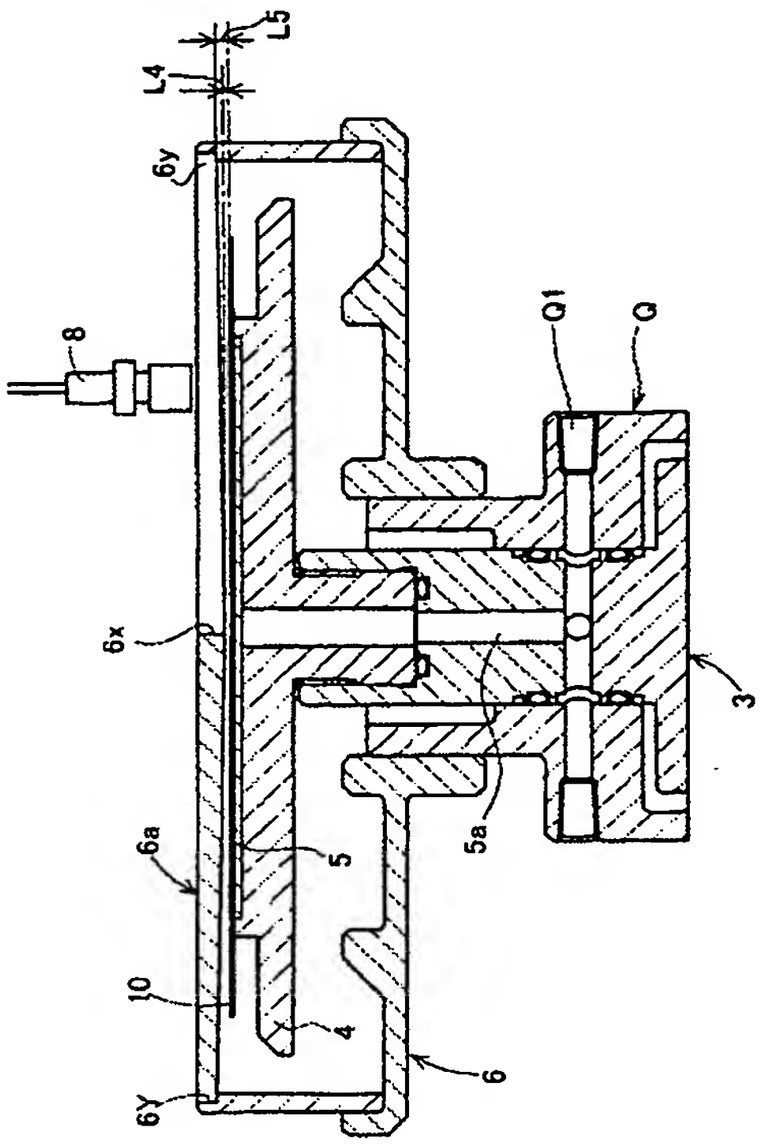
[Drawing 8]



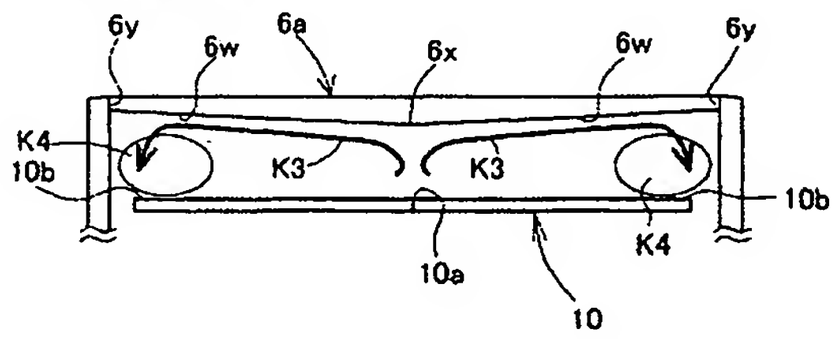
[Drawing 9]



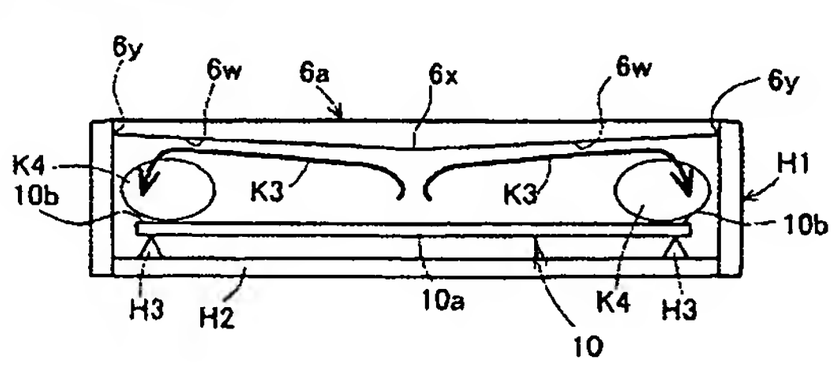
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]